(12) UK Patent Application (19) GB (11) 2 022 723 A

(21) Application No 7919721
(22) Date of filing 6 Jun 1979
(23) Claims filed 6 Jun 1979
(30) Priority data
(31) 7816941U
(32) 6 Jun 1978
(33) Fed Rep of Germany (DE)
(43) Application published
19 Dec 1979
(51) INT CL²
F16C 19/02
(52) Domestic classification
F2A 5B4 9P D24 D32
(56) Documents cited
GB 1399430
GB 1071172
(58) Field of search
F2A
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(54) Ball bearing

(57) A radial ball bearing assembly comprises an inner raceway groove (11), an outer race ring (12) and balls (13). The ring (12) is a sliding fit in a sleeve (14) which has two flanges (15, 16). The ring (12) has a portion (17) axially spaced from one of the flanges (15) for accommodating means for sealing (18) and/or loading the bearing.

FIG. 1.

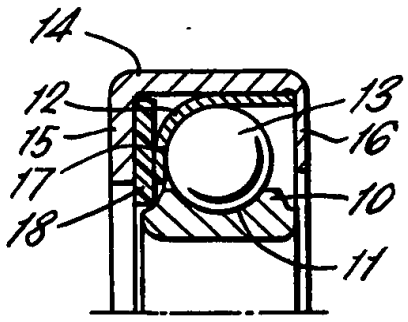

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FIG. 1.

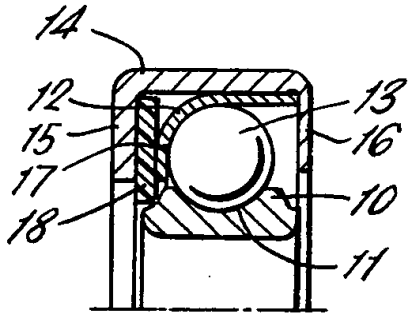


FIG. 2.

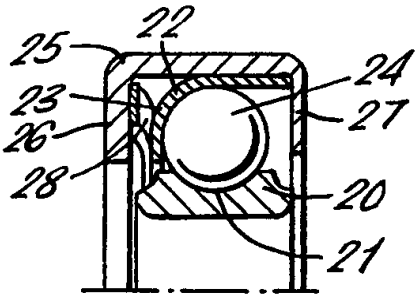
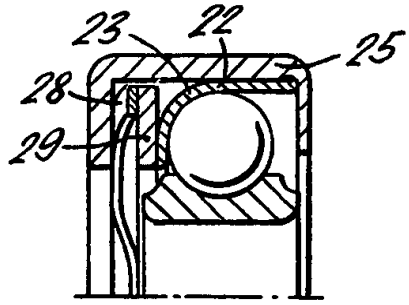


FIG. 3.



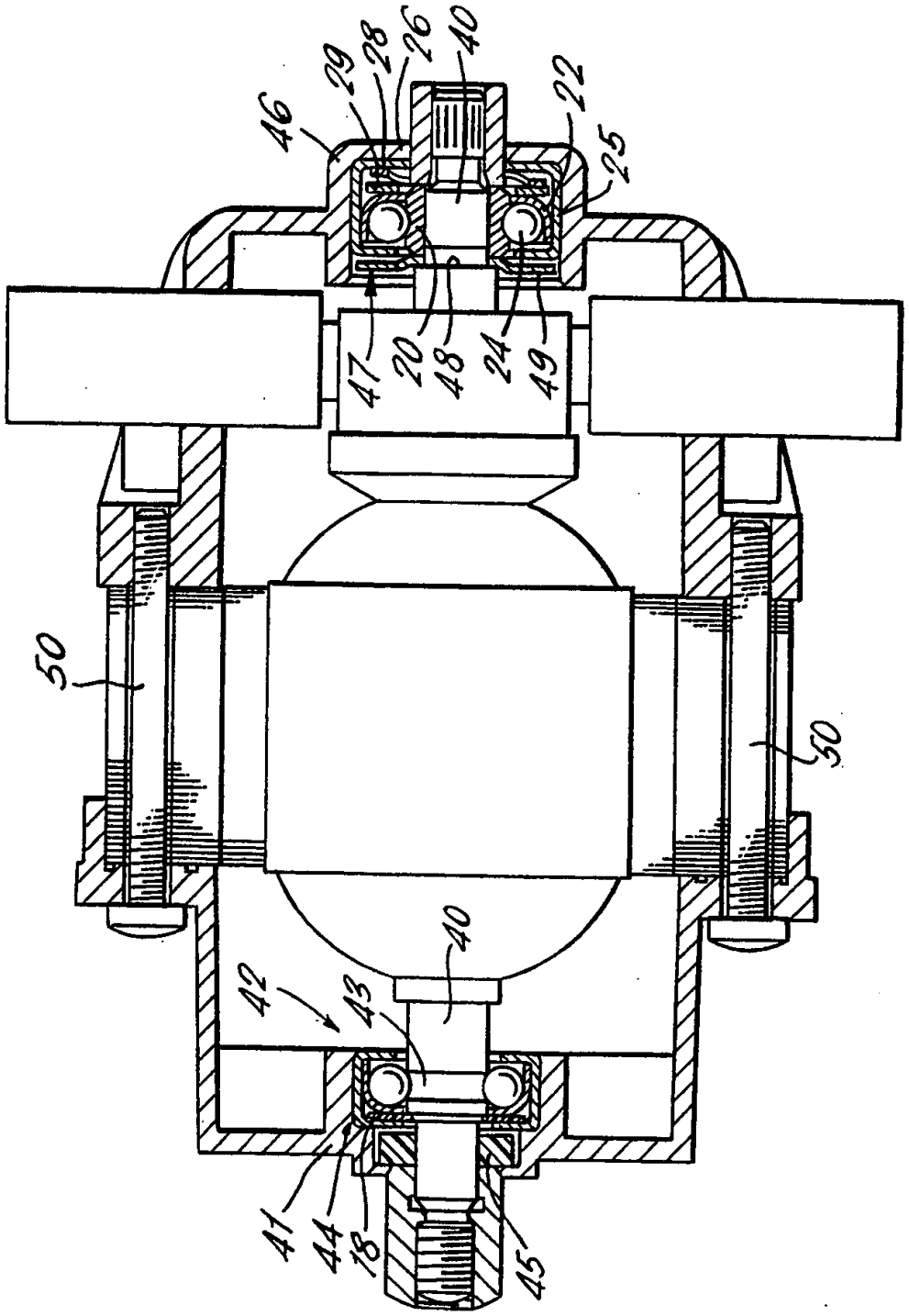


FIG. 4.

SPECIFICATION

A radial ball bearing assembly

This invention concerns a radial ball bearing assembly.

The invention provides a radial ball bearing assembly comprising an inner raceway groove, a ring providing an outer raceway, a plurality of balls arranged to roll on both raceways, and a sleeve, the ring being disposed as a sliding fit in the bore of the sleeve, the sleeve having radially inwardly extending flanges one on each axial side of the balls, the ring having a portion extending radially inwardly on one axial side of the balls, which portion provides a surface axially facing away from the balls and towards one of the sleeve flanges, the said portion of the ring and the said one sleeve flange being axially spaced from each other in order to accommodate means for sealing and/or loading the bearing.

A resiliently deformable washer may be located between the said portion of the ring and the said one sleeve flange, which washer may bear against an element providing the inner raceway groove.

An annular spring which may be corrugated circumferentially, may be located between the said portion of the ring and the said one sleeve flange.

A rigid metal washer may be located between the said portion of the ring and the said one sleeve flange.

The outer ring may be an annular dished sheet metal element.

Embodiments of the invention will now be described by way of example, reference being made to the accompanying drawings, of which

Figure 1 is part of an axial section of one embodiment of the invention;

Figure 2 is part of an axial section of a second embodiment of the invention;

Figure 3 is part of an axial section of a third embodiment of the invention; and

Figure 4 is an axial section of an electric motor provided with bearing assemblies according to the invention.

The cageless ball bearing assembly shown in Figure 1 comprises an inner solid race ring 10 having a raceway groove 11, an outer race ring 12 providing an outer raceway and formed from relatively thin-walled sheet metal by pressing or stamping, and a plurality of balls 13 arranged to roll on both raceways. The outer race ring 12 is disposed and is axially slidable in the bore of a sleeve 14, which sleeve is formed from sheet metal with a radially inwardly extending flange 15 on one axial side of the balls 13. The sleeve 14 also has another radially inwardly extending flange 16 on the other axial side of the balls 13, which flange is bent over after the race rings 10 and 12 and balls 13 are positioned in the bore of the sleeve 14. To facilitate bending over of the flange 16, it is made relatively thin. The outer race ring 12 is formed as an annular dished element and has a portion 17 which provides a surface facing axially away from the balls 13 and towards flange 15 of the sleeve 14. Flange 15 and portion 17 are axially spaced apart from each other and accommodate a resiliently deformable sealing washer 18 of, for example, plastics which washer bears against the inner race ring 10.

The bearing assembly illustrated in Figure 2 is basically the same as that shown in Figure 1 in having an inner race ring 20 with a groove 21, an outer race ring 22 with a portion 23 balls 24 and a sleeve 25 with flanges 26 and 27. Instead of washer 18 an annular spring 28 is located between flange 26 and portion 23 which spring is circumferentially corrugated and preloads the bearing.

Figure 3 shows a bearing assembly substantially the same as that shown in Figure 2, but located between corrugated spring 28 and portion 23 of race ring 22 is a rigid metal washer 29, which is axially movable in the sleeve 25.

Figure 4 illustrates the mounting of an electric motor for a vacuum cleaner by bearing assemblies according to the invention. Referring to the left hand side of the drawing, a rotor shaft 40 extends through an end plate 41. A fixed or locating bearing assembly 42, basically the same as the bearing assembly shown in Figure 1, is mounted with a tight fit in the bore of end plate 41. Instead of inner race ring 10, the balls 13 roll on a raceway groove 43 formed directly on the shaft 40. The bearing 42 is axially located against a shoulder 44 provided by end plate 41. In addition to sealing washer 18, another seal 45 is located in the bore of end plate 41 to the left of bearing 42 to prevent dust from reaching the interior of the motor.

The right hand commutator side of the motor has an end plate 46 through which shaft 40 extends. A loose or non-locating bearing assembly 47, basically the same as the bearing assembly shown in Figure 3, is mounted in the bore of the end plate 46, advantageously as a tight fit to avoid the risk of any wear occuring in the bore of the end plate. The inner race ring 20 of the bearing 47 is mounted on the shaft 40, and between the ring 20 and a shoulder 48 of the shaft there is mounted a flinger disc 49 which forms an effective seal. The corrugated spring 28 urges apart the flange 26 of the sleeve 25 and the washer 29. The washer 29 bears against portion 23 of outer race ring 22 so urging the ring against the balls 24. The balls 24, located in raceway groove 21 of the inner race ring 20, urge the ring 20 against flinger disc 49 which in turn is urged against shoulder 48. Thus the bearing 47 is axially loaded and play is taken up.

The two bearings 42 and 47 are also axially loaded by screws 50, which secure the two end plates 41 and 46 together and by means of which any errors in alignment can be prevented.

The axial preloading of the rotor shaft mounting gives smooth running, because the two ball bearings are free from play. Even when the end plates are made from a light alloy for example, the axial preloading of the bearings ensures freedom from play despite different coefficients of thermal expansion of the end plates 41 and 46 and sleeves 14 and 25.

The preloading spring 28 by frictional engagement also provides some braking action on the outer race ring 22 and thus effectively prevents any shifting or turning of the outer race ring 22 in the sleeve 25.

Modifications to the described embodiments are envisaged, for example, the sealing washer 18 in Figure 1 can be replaced by a rigid washer to provide a non-sealed fixed bearing. Or an elastically resilient washer can be used so that as well as sealing the bearing it axially preloads the bearing.

A common feature of all the described and illustrated embodiments is that they consist of the same basic elements and only one part has to be modified or fitted as required for a specific function. This reduces production costs, because the bearing parts can be made in large quantities, and storage costs are reduced because only the partly assembled bearing need be stored and not different types of completely assembled bearings.

CLAIMS

1. A radial ball bearing assembly comprising an inner raceway groove a ring providing an outer raceway, a plurality of balls arranged to roll on both raceways, and a sleeve, the ring being disposed as a sliding fit in the bore of the sleeve, the sleeve having radially inwardly extending flanges one on each axial side of the balls, the ring having a portion extending radially inwardly on one axial side of the balls, which portion provides a surface axially facing away from the balls and towards one of the sleeve flanges, the said portion of the ring and the said one sleeve flange being axially spaced from each other in order to accommodate means for sealing and/or loading the bearing.

2. An assembly as claimed in claim 1, wherein a resiliently deformable washer is located between the said portion of the ring and the said one sleeve flange, which washer bears against an element providing the inner raceway groove.

3. An assembly as claimed in claim 1, wherein an annular spring, which is corrugated circumferentially, is located between the said portion of the ring and the said one sleeve flange.

4. An assembly as claimed in claim 1 or 3, wherein a rigid metal washer is located between the said portion of the ring and the said one sleeve flange.

5. An assembly as claimed in any preceding claim, wherein the outer ring is an annular dished sheet metal element.

6. A radial ball bearing assembly substantially as herein described with reference to and as shown in Figure 1 or with reference to and as shown in Figure 2 or with reference to and as shown in Figure 3 or with reference to and as shown in Figure 4 of the accompanying drawings.

Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd., Berwick-upon-Tweed, 1979.
Published at the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.